

It would be advisable that the Presidents of the following Societies should be ex-officio members of the Government Grant Committee, viz. :—

The Royal Society of Edinburgh,
 Royal Irish Academy,
 Royal Astronomical Society,
 Mathematical Society,
 Chemical Society,
 Linnean Society,
 Zoological Society,
 Geological Society,
 Physical Society,
 Institution of Civil Engineers,
 Institute of Mechanical Engineers,
 General Council of Medical Education and
 Registration of the United Kingdom.
 Royal College of Physicians,
 Royal College of Surgeons, and
 British Association.

No definite rule can be laid down as to the amounts to be awarded in individual cases. These must depend upon various circumstances, especially on the amount of time which the investigator devotes to the inquiry.

There would be no objection to the application of some portion of this fund to the payment of such clerical assistance as may be found necessary.

I should feel obliged if you will consult the Council of the Royal Society on this scheme and inform me what is their opinion of it, and also give me the benefit of any suggestions as to modifications that may occur to them or to you.

I have the honour to remain, Sir,
 Your obedient servant,
 (Signed) RICHMOND AND GORDON

LETTER TO THE PRESIDENT OF THE ROYAL SOCIETY.

*Science and Art Department, South Kensington, S.W.,
 May 29, 1876*

SIR,—In reference to our conversation on Monday last on the subject of the Duke of Richmond and Gordon's letter of April 29, I should feel obliged by your informing the Council of the Royal Society that the Lords of the Committee of Council on Education agree with you in thinking that, under the circumstances, it would perhaps be more advisable to leave the grant of 1,000*l.* exactly as at present. The conditions of the Lord President's letter would then apply only to the vote of 4,000*l.* Should the Council of the Royal Society concur in this view, we will communicate with the Treasury on the subject. The recommendations of the Royal Society with respect to the appropriation of the 4,000*l.* must, no doubt, be liable to revision by the Minister responsible to Parliament for its due administration, and of this responsibility he cannot divest himself. But the power is one, we believe, for the exercise of which there is never likely to be occasion. Should it, however, happen that the Committee of Council on Education found it inadvisable to act on all of the recommendations of the Royal Society, the best course would probably be to give the Council an opportunity of revising them; so that, if thought desirable, the items of the grant, to which exception had been taken, might be allocated in some other way. If the Royal Society are still desirous that the grant should be accepted or rejected as a whole, the Lords of the Committee of Council on Education will of course undertake that this shall be done. But they believe on consideration that the Council will agree that such a course would be likely to have a mischievous effect, and entail great hardship on those recipients of grants who, from the success that had attended their investigations, might naturally have expected the continuance of their grants.

As respects the reports of progress, My Lords believe that the Council of the Royal Society will see that Parliament will naturally desire to have laid before them such a

report from those capable of giving an opinion, as will enable them to judge of the nature and amount of work being done, and the desirability, or otherwise, of continuing the grants. It is not asked that the report should be in any great detail; as a rule it would be sufficient if it were of a general character, unless some of the subjects should from their special nature seem to require more precise information. The Lords of the Committee of Council on Education are fully aware of the great difficulties which surround the question of the direct encouragement of research and of the labour and responsibility that must necessarily be entailed on those who undertake to organise the experiment in this country. They therefore are glad to find that they may reckon on the cordial co-operation of the Royal Society, to whom they naturally first appealed to aid them in this matter.

I have the honour to be, Sir,
 Your obedient Servant,
 (Signed) SANDON

J. D. Hooker, Esq., C.B., M.D., &c.,
 President of the Royal Society

LETTER TO LORD SANDON.

*The Royal Society, Burlington House, W.,
 June 2, 1876*

My Lord,—With reference to your Lordship's letter to the President of the Royal Society dated May 29, I am to inform you that the President and Council of the Royal Society concur in the proposal therein contained, namely that, while the grant of 1,000*l.* should remain exactly as at present, a vote of 4,000*l.* should be taken on the conditions expressed in the Lord President's letter; and that, in case it should happen that the Committee of Council on Education found it inadvisable to act on all the recommendations of the Royal Society, the Council of the Royal Society should have an opportunity of revising them, so that, if thought desirable, the items of the grant to which exception had been taken might be allocated in some other way.

I have the honour to be, my Lord,
 Your obedient Servant,
 (Signed) G. G. STOKES, Secretary, R.S.
 The Lord Sandon, &c., &c., &c.

WALLACE'S GEOGRAPHICAL DISTRIBUTION OF ANIMALS¹

The Geographical Distribution of Animals, with a Study of the Living and Extinct Faunas, as Elucidating the Past Changes of the Earth's Surface. By Alfred Russel Wallace. Two Vols. 8vo. (London: Macmillan and Co., 1876.)

II.

THE second part of his great work on Geographical Distribution Mr. Wallace devotes to the discussion of fossil animals. It might seem at first sight, as our author observes, rather out of place to begin the systematic treatment of this subject with extinct animals rather than with recent ones. But those who take the trouble to read these most interesting chapters will be speedily convinced to the contrary. Imperfect as is our knowledge of the geological past, enough has been already ascertained to enable some enchanting theories to be started which account to a greater or less extent for some of the most difficult problems of the present. As regards the comparatively recent extirpation of large and important forms which has taken place in Europe, in North America, and in South America alike since Post-Pliocene times, "it is clear," our author tells

¹ Continued from p. 168.

us, "that we are now in an altogether exceptional period of the earth's history," some idea of which it is very necessary to realise. "We live in an impoverished world, from which all the hugest and fiercest and strangest forms have recently disappeared." The cause of this great change over such a large part of the world's surface was, in Mr. Wallace's opinion, the "glacial epoch," which, according to Mr. Belt's theory, heaped up most of the water in the earth in mountains of ice round the two poles and left the great ocean-beds comparatively dry. This, we are told, "must have acted in various ways to have produced alterations of the levels of the ocean as well as vast local flows, which would have combined with the excessive cold to destroy animal life." We are not sure that this is a *very* satisfactory explanation of the simultaneous disappearance of the great Irish Elk from Europe

and the *Megatherium* from South America, but it is at all events *some* explanation of an obscure point, and deserves careful consideration. So also do those few cases in which geological evidence is already sufficient to give us indications of the original birth-place of some of the mammalian types, and of the mode in which has come about their present state of distribution.

The third section of Mr. Wallace's great work, which we now enter upon, is, in fact, the most important of the whole, and that to which the previous chapters may be regarded purely as introductory. Having shown us what the six great divisions of the earth's land-surface, zoologically considered, are, and how it may have come to pass that they are what they are, Mr. Wallace takes them one after the other in order, and gives us a separate memoir upon each of them, and their special zoological



FIG. 3.—A Brazilian Forest, with characteristic Mammalia.

characteristics. After a description of their territorial outlines, illustrated by hypsometrical maps in which the boundaries of the sub-regions are likewise indicated, general remarks are given upon their leading zoological features. The chief forms of mammals, birds, reptiles, batrachians, fishes, butterflies, beetles, and land-shells, which characterise them are pointed out. The Sub-regions into which they are divisible are then taken up and treated in greater detail, and the leading authorities from whose labours the necessary facts have become known to us are cited. At the end of each memoir "tables of distribution" are added, in which are given—first, a list of the families of the selected groups of animals represented within the Region, with an indication of their range, if any, beyond the Region, and secondly, a similar list of the genera of the terrestrial mammals

and birds, with an indication of their ranges both within and beyond the Region. Three or four plates, drawn by the late Mr. J. B. Zwecker, accompany each memoir.

These are intended to illustrate the physical aspect and zoological character of some well-marked division of the region, and as only such species are figured as "do actually occur together in a state of nature," the scenes represented are "at all events not altogether impossible ones," which is more than many of our artistic friends can say of *their* productions! While we could have wished that Mr. Zwecker had resorted in some cases to the Zoological Society's Gardens rather than to previously published figures for the models of some of his animals, we must acknowledge generally the truthfulness of these illustrations and the faithful manner in which they have been executed. At home alike in the tropics of the Oriental

and of the Neotropical regions, no one surely could have been more competent than Mr. Wallace to select the most characteristic forms for these plates, and we have great pleasure in reproducing some of them in these columns.

To those who know anything of Natural History the enormous labour involved in the compilation of these six memoirs will be at once apparent. The mass of details to be gone through in bringing together the most prominent known facts connected with the mammals, birds, reptiles, amphibians, fishes, butterflies, beetles, and land-shells of every different part of the world's surface, is a task that the boldest naturalist might well stand aghast at, especially when it is recollected that these details have to be picked out from several hundred different works and periodicals published in every quarter of the

globe. That errors can be escaped in such a compilation even by a writer so cautious and so competent as Mr. Wallace is manifestly impossible. No intellect could expect to obtain personal acquaintance with more than a few selected branches of such a multifarious subject, and for the rest an author must trust to second-hand information. The selection of such second-hand information and its reduction into a uniform shape, is of itself a task of appalling magnitude, and we can only congratulate Mr. Wallace on having had strength and leisure to accomplish such a Herculean labour.

The fourth and last part of Mr. Wallace's work contains, as we have already explained, a review of the distribution of the different groups of animals which he has selected for the illustration of geographical distribution arranged in systematic order. The families are taken up



FIG. 4.—A Forest Scene on the Upper Amazon, with some Characteristic Birds.

one after another, the principal genera are mentioned, and notes are given on the more remarkable species. At the end of each order is appended a series of remarks on the general distribution of the whole group. This is in fact the storehouse of information from which the essays on the six zoological regions have been compiled, and should in strictness have preceded the third section of the work instead of following it. The author wisely recommends persons not well versed in zoology to read the more important parts of it—especially the observations at the close of each order—before they begin Part III. As regards this systematic treatise the observations which we have already made on the difficulties to be mastered in the compilation of the memoirs relating to the six geographical regions are still more

applicable. It would be easy to point out many passages in which Mr. Wallace has not in our opinion made the most judicious choice of authorities. Errors of detail are, however, as has been already stated, unavoidable in a work of this extent—happy is he who makes fewest of them! Even in the case of some of the largest and most prominent families of the great class of mammals, naturalists are by no means yet agreed as to the number of species and genera that should be admitted. For example, Mr. Wallace, we observe, assigns “four, or perhaps five” rhinoceroses to Africa, but Prof. Flower—one of the highest living authorities on this class of animals, in a recent paper read before the Zoological Society of London—could only recognise *two*. Mr. Wallace admits the validity of *Elasmognathus* of

Gill as a genus of Tapirs, and adopts Dr. Gray's multitudinous division of the well-defined and eminently natural group of Eared Seals (*Otaria*). Many naturalists would hesitate before following Mr. Gill and Dr. Gray as authorities on these (or perhaps we may add on many other) subjects. But such and similar errors on questions of detail do not, we believe, affect the validity of Mr. Wallace's general conclusions. After the miserable stuff usually thrust before us in even the best and most recent treatises on geography, when the question of distribution comes to be touched upon, it is truly refreshing to turn to Mr. Wallace's broad and enlightened views on this subject. Future compilers of geographical manuals will have an easy task when they come to this most important but hitherto most ill-used part of their work, if they will only cast aside all that they have previously written, and borrow freely from the volume now before us.

Mr. Wallace has already registered many claims on the gratitude of naturalists present and future. In their interest he has explored the tropics of the east and the wildernesses of the west, and has brought home numberless novelties. He has written one of the best and most instructive books of naturalists' travels ever yet issued. He was, as is well known, the joint inventor with Mr. Darwin of the theory of "Natural Selection." But beyond all these scientific feats—and they are no mean ones—he has accomplished a task that will extend his fame even more widely amongst those who love science, as the author of the first sound treatise on zoological geography.

TWINING'S "SCIENCE MADE EASY"

Science Made Easy: a Series of Familiar Lectures on the Elements of Scientific Knowledge most Required in Daily Life. By Thomas Twining. (London: Chapman and Hall, 1876.)

THESE thin clearly printed quartos represent a remarkable experiment; an attempt to diffuse good teaching without good teachers, and to reproduce first-rate popular lectures without the need of multiplying skilled lecturers to deliver them. The author, Mr. Twining, constructed in 1856 an Economic Museum at Twickenham, which exhibited illustrations of scientific knowledge as applicable to the concerns of daily life. After fifteen years of continuous improvement this collection was destroyed by fire; but the experience gained in working it strongly impressed upon its author the conviction that the level of popular culture in this country is below the point at which intelligent appreciation of the simplest scientific object becomes possible; since his fine museum, with its methodical classification, its careful explanatory labelling, and the oral instruction of its active curator, failed to convey knowledge to the mass of visitors, to whom the very alphabet of science was unknown, and whose minds were untrained to the reception of the simplest truths. It is a bold thing for one man to enter on the task of educating a people; but Mr. Twining's enthusiasm was equal to the attempt. Precluded himself from lecturing, he prepared carefully-written lectures, founded on his Twickenham experience, and entrusted them to others to deliver. The swimming bath of East Lambeth, dry and unused in the winter, was fitted up as a lecture-room, and a course of five lectures was there

delivered to attentive audiences of more than a thousand persons. Demands for their repetition arose from all parts of London; and during the last nine seasons they have been delivered in various mission-rooms, institutes, and clubs of the working-classes to crowded and eager hearers. Uneducated learners, however respectfully attentive, yet carrying away from a lecture ideas crude and disjointed, may lapse within a few days into their original ignorance; Mr. Twining therefore began early to test his audiences by a system of examinations, so modified as to meet the inexperience of candidates and the elementary character of the teaching. Examination programmes were issued, containing a full set of possible questions on the course, from ten to fourteen being allotted to each lecture, with the understanding that from every one of these groups two questions would be selected by the examiner; while a preliminary examination "of a friendly kind" struck off all who were clearly incapable of presenting themselves with any prospect of success. Under these limitations we are told that a large number of candidates have obtained prizes and certificates at successive examinations, their papers showing that they had grasped and could reproduce intelligently a fair amount of the teaching which they had received.

Mr. Twining thinks that what has been done in London may easily be done elsewhere; he therefore prints his lectures, and prefaces them with minute instructions for the guidance of such amateurs as may wish to organise and carry out the course. In its delivery two persons are necessary, a "reader" and a "demonstrator." The reader must be a good elocutionist, and need be nothing more; need know nothing of science in general, nothing of the particular science on which he is discoursing. If he is clever enough to introduce here and there a happy local *à propos*, so much the better; but he is a mere vehicle for the transmission of the matter contained in his text, and is not required to do more than utter it. The demonstrator must know something of science, and have some practice in manipulation; but the simplicity of the experiments and the fulness of the printed directions reduce this necessity to a minimum, so that the author proposes to himself as suitable interpreters in a country town the national schoolmaster as reader, and the doctor or dispensing chemist as demonstrator. Reference numbers, dotted lines, and other devices, indicate the relative duties of the two performers, who cannot of course expect to work smoothly and in concert without repeated and laborious rehearsals.

The ordinary science teacher, luxuriating in abundant time, in ample apparatus, and in educated hearers, might be tempted to speak unfavourably of the lectures themselves, as too condensed for practical usefulness. He might say, and say truly, that the matter contained in the three lectures on Mechanical Physics could scarcely, by a master teaching boys, be included in the five-and-twenty lectures of an ordinary school term; that the two lectures on Chemistry are overgrown object lessons; that no one of the seventeen topics treated in the single lecture on Chemical Physics would demand less than an hour's careful teaching in a class-room; and that the "questionary," or examination programme, represents pure and simple cram. But such criticism would be wholly unfair applied to Mr. Twining's enterprise, as overlooking its